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(54)【発明の名称】　ウエハ検出用一体的圧電センサーを有するチャック

(57)【要約】

DRAWINGS

[Drawing 1]

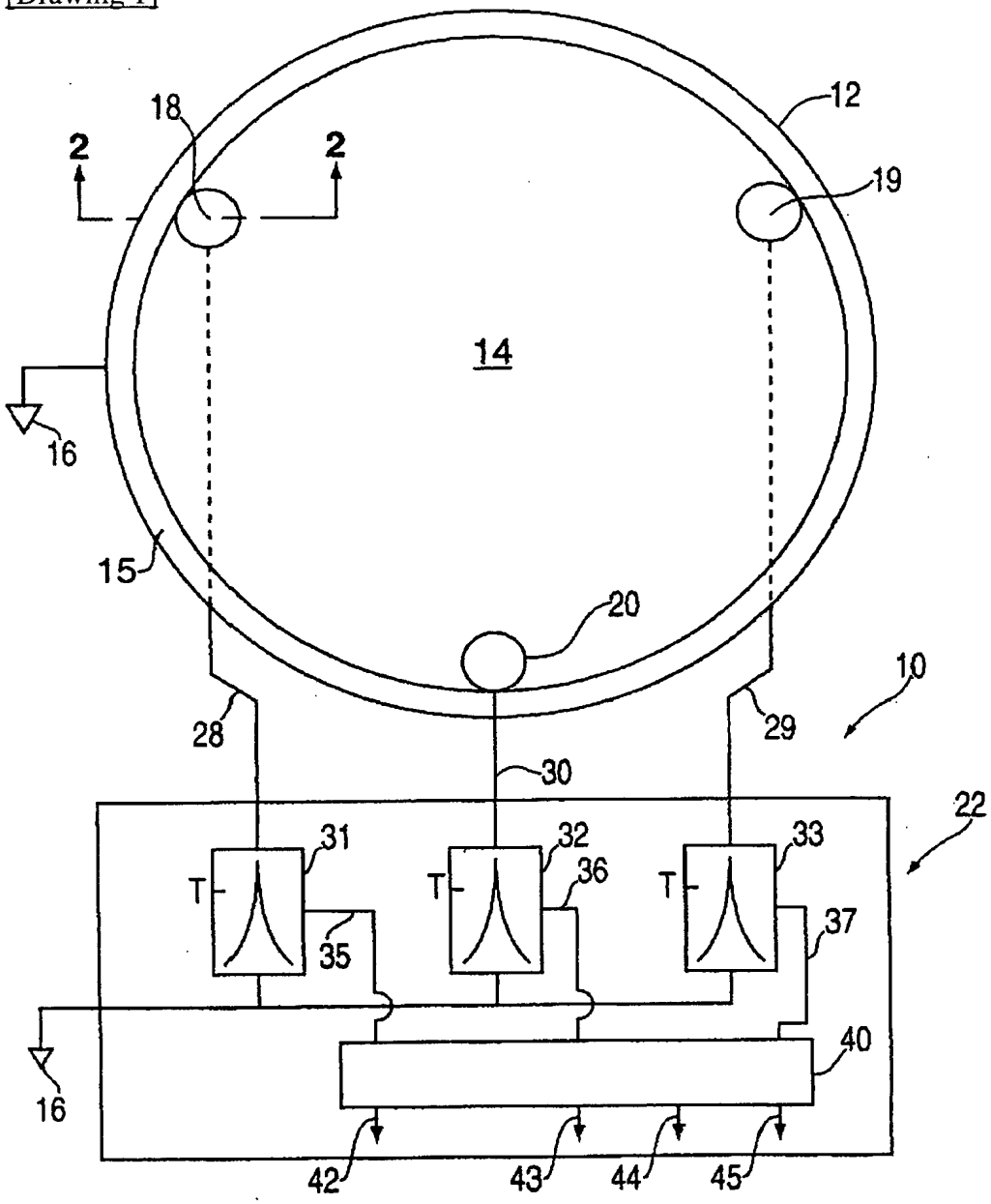

FIG. 1

[Drawing 2]

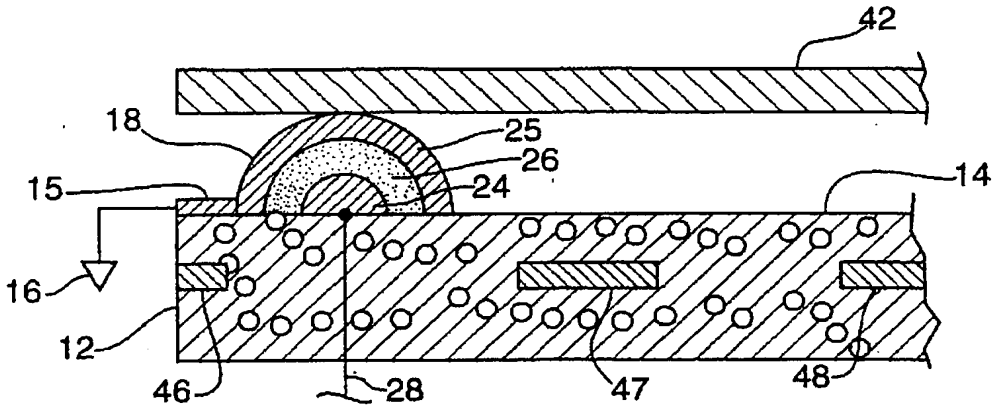

FIG. 2

[Drawing 3]

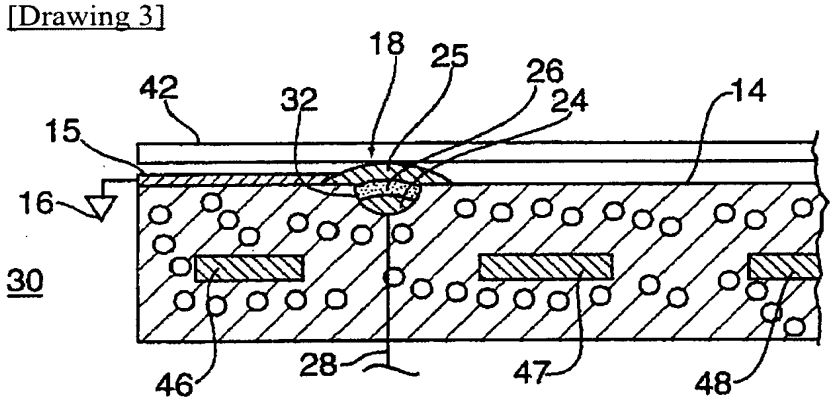

FIG. 3

[Drawing 4]

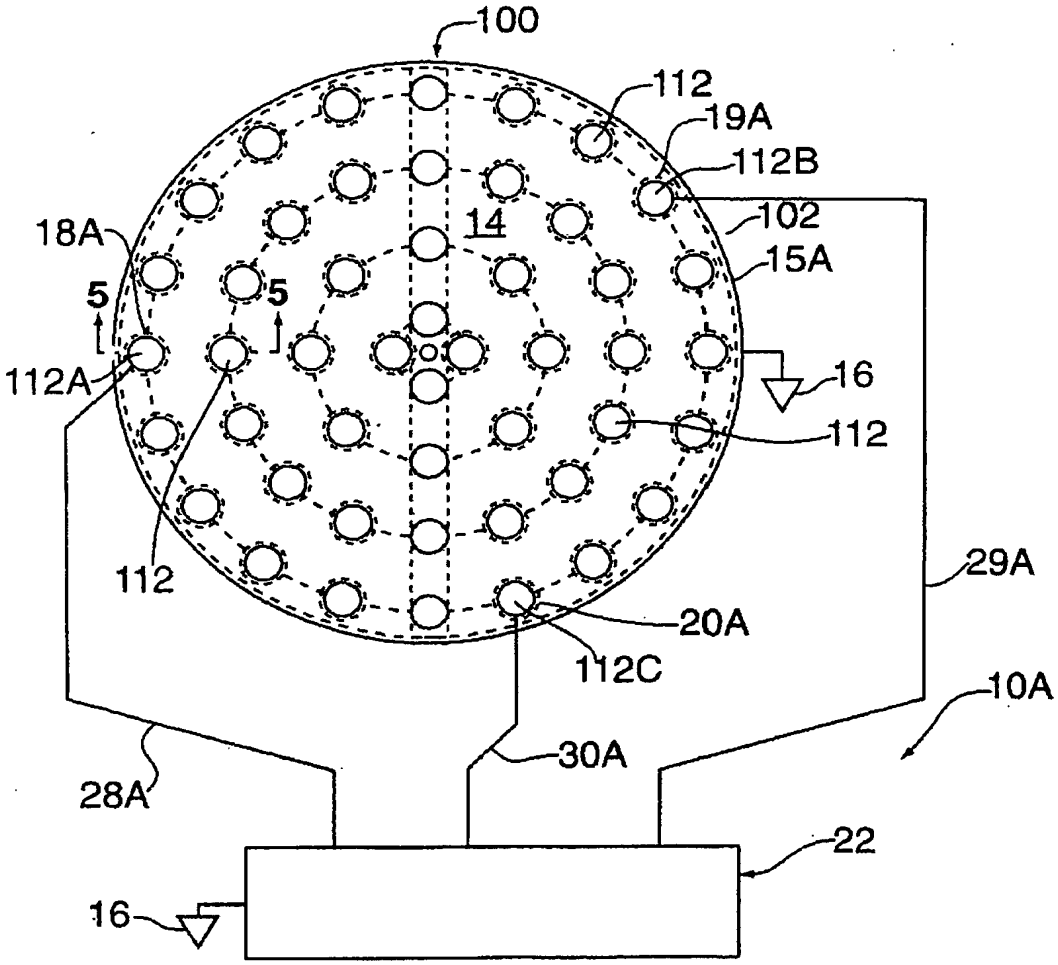

FIG. 4

[Drawing 5]

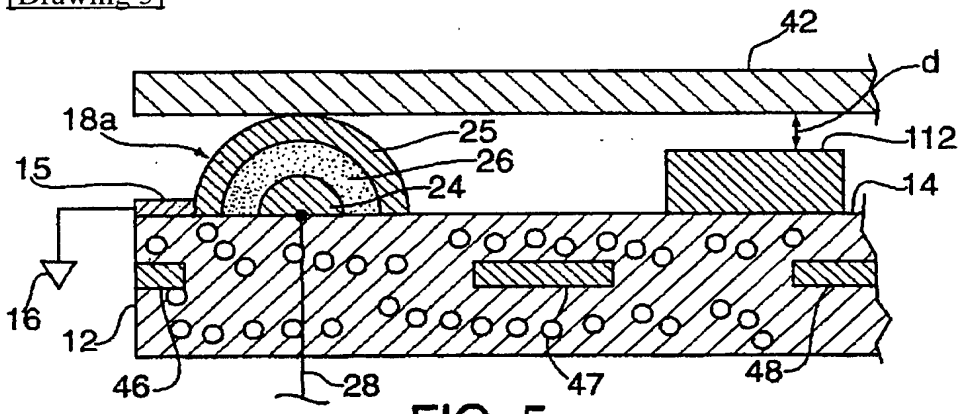

FIG. 5

[Drawing 6]

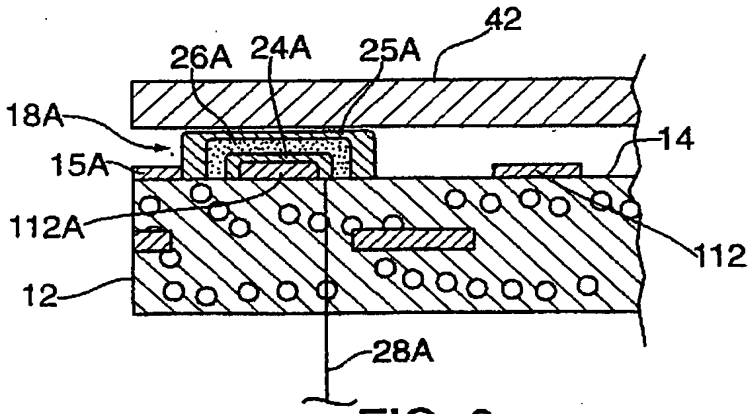

FIG. 6

[Translation done.]* NOTICES *
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
Background of invention Technical field to which 1. invention belongs Generally, about processing of a semi-conductor wafer, this invention detects whether a semi-conductor wafer exists on a semi-conductor wafer chuck at a detail, and detects whether a semi-conductor wafer is located at the core of a chuck, and relates to the equipment and the approach which used one or more piezo-electric sensors in order to detect the reinforcement which holds a semi-conductor wafer by the chuck more.
[0002]
2. Prior art In the process for manufacturing an integrated circuit, typically, a semi-conductor wafer is placed on the support front face of semi-conductor wafer chucks, such as for example, the static electricity chuck, and is supported. The conventional static electricity chuck contains one or more electrodes sandwiched between two layers of dielectric materials. A wafer is placed on one front face of a dielectric layer so that a wafer and an electrode may be separated by dielectric layer thickness. For example, a bipolar electrostatic chuck contains two electrodes by which bias was carried out to the antipole nature arranged at the parallel form. An electrical potential difference is impressed to an electrode so that a dielectric layer may be crossed and the difference of a charge may occur between a wafer and an electrode. Consequently, a wafer is held on the

surface of a chuck through Coulomb force.
[0003]
Another type of the static electricity chuck is a type called the so-called Johnson-Ra Bec (J-R) chuck, and it is indicated by U.S. Pat. No. 5,117,121 ("the equipment and the approach" of impressing an electrical potential difference to the static electricity chuck) by which the patent was given to WATANABE etc. on May 26, 1992. Typically, a J-R static electricity chuck contains the electrode embedded into the body of an aluminum titanic-acid-ized compound or the ceramic ingredient of the semi-conductor of alumimium nitride as indicated by this patent. And by a charge moving to the background of a wafer, when an electrical potential difference is impressed to inter-electrode, when a charge moves to the front face of a chuck from an electrode, semi-conductor wafers, such as a silicon semi-conductor wafer, can be drawn near to the static electricity chuck in static electricity, so that the clearance space which divides a Johnson-Rahbek effect, i.e., a wafer and a chuck front face, may be crossed and very strong electrostatic force may appear. When an integrated circuit is manufactured in a wafer, such a static electricity chuck is used into a semi-conductor wafer processing system, in order to support a semi-conductor wafer.
[0004]
Since an output is increased, and in order to reinforce the dependability of a semi-conductor wafer processing system, it is important to detect whether it has sufficient holding power to carry out positioning maintenance of the semi-conductor wafer suitably on a chuck in the case of whether a semi-conductor wafer exists on a chuck or it is located at the core of a chuck, and subsequent semi-conductor wafer processing.
[0005]
in order [furthermore,] to decrease the amount of the contamination particle which adheres to a wafer from a chuck front face in the support front face of a ceramic static electricity chuck as known by this contractor -- a wafer -- alienation -- the mask is prepared. A mask is the pad or supporter material prolonged in the way outside the plurality for engaging with the semi-conductor wafer estranged from support or the upper front face of the static electricity chuck on the occasion of chucking (maintenance) and subsequent semi-conductor wafer processing, and holding. such a wafer -- alienation -- a mask is transferred in common and indicated by U.S. Pat. No. 5,656,093, such as the BURUKU heart published on August 12, 1997. a wafer -- alienation -- also in the case of processing of the semi-conductor wafer which used the static electricity chuck equipped with the mask A semi-conductor wafer exists on a mask and a semi-conductor wafer is located at the core of a chuck according to the core of a mask. And it is important to detect whether chucking (maintenance) of the semi-conductor wafer is carried out to maintaining the semi-conductor wafer suitably positioned on the chuck on the occasion of subsequent semi-conductor processing by sufficient strength for a chuck through the mask.
[0006]
When a wafer is located on a chuck, the equipment and the approach for determining the existence of a semi-conductor wafer and alignment containing the system which measures change of the capacity produced in sensor inter-electrode on chucks, such as the static electricity chuck, are learned by this contractor. In the United States patent application serial numbers 08/873,268 for which it applied on June 11, 1997, such as the

artificer BURUKU heart transferred in common, it argues about this system. Although this capacity gaging system can measure existence of a wafer and alignment very correctly, measurement receives the effect of the electrical noise mainly generated by the plasma of the processing interior of a room. Furthermore, such a capacity gaging system cannot measure the amount of the chucking (maintenance) force applied to the fixed wafer.

[0007]

Therefore, it detects whether a semi-conductor wafer exists on a chuck, and detects whether the semi-conductor wafer is located at the core of a chuck, and the equipment and the approach of not being influenced substantially which were improved newly are required for the source of electrical noise of the processing interior of a room for detecting the chucking (maintenance) force impressed to a wafer in the case of subsequent semi-conductor wafer processing.

Indication of invention The problem relevant to the conventional technique detects whether the semi-conductor wafer by this invention exists on a chuck, detects whether the semi-conductor wafer is located at the core of a chuck, and is solved by the equipment and the approach for detecting the force which carries out chucking (maintenance) of the wafer to a chuck in the case of subsequent semi-conductor wafer processing. This invention makes one or more piezo-electric sensors placed between details between a semi-conductor wafer and a semi-conductor wafer chuck. When a semi-conductor wafer is held at a chuck, a piezo-electric sensor is pressed and the electrical and electric equipment is generated according to the piezo-electric effect. The electrical and electric equipment generated in piezo-electricity is detected, and a signal to show existence of the wafer on a chuck is generated.

[0008]

In the gestalt of another operation, when a semi-conductor wafer is processing of a subsequent semi-conductor wafer and it is held even as sufficient strength to maintain a wafer on a chuck, the amount of the electrical and electric equipment generated by the piezo-electric sensor which intervenes between a chuck and a semi-conductor wafer is determined, and a threshold level (for example, piezo-electric current) is set up. the electrical and electric equipment generated by the piezo-electric sensor which intervenes between a semi-conductor wafer and a chuck should be detected, and decision should do about whether the amount of the detected electrical and electric equipment is equal to a threshold level at least -- chucking (maintenance) sufficient if it becomes to maintain [which comes out so and exists] a wafer suitably in the case of subsequent semi-conductor wafer processing -- strength -- the signal which shows things is generated.

[0009]

With the gestalt of another operation, two or more piezo-electric sensors estrange at equal intervals mutually, and are put on the surroundings on the front face of a periphery of a chuck support front face, the piezo-electric sensor which a semi-conductor wafer is held on a chuck support front face, and has it in the middle of a chuck and a semi-conductor wafer is pressed, and this piezo-electric sensor generates the electrical and electric equipment. The generated electrical and electric equipment is detected and it is determined [of two or more piezo-electric sensors] whether the electrical and electric equipment was generated by two or more piezo-electric sensors of all, or it was all generated from fewer things. If it is determined that the electrical and electric equipment

is generated by two or more piezo-electric sensors of all, the 1st signal which shows that there is a semi-conductor wafer at the core of a chuck will be generated. If it is determined that the electrical and electric equipment is all generated from fewer things, the signal which shows the thing of two or more piezo-electric sensors for which the semi-conductor wafer is not put on the core of a chuck will be generated.

[0010]

Hereafter, detailed explanation of this invention is given with reference to an accompanying drawing. Although the same common element is directed in a drawing, when possible, the same reference number is used for it.

Detail explanation of the gestalt of implementation of invention Generally reference of drawing 1 shows the semi-conductor wafer detection equipment of the gestalt of operation of this invention by the number 10. The illustrated equipment 10 is used together with the substrate support chuck 12 including the support front face 14, and the static electricity chuck 12 of the type mentioned above. Although this invention is shown with the static electricity chuck 12, this invention can be used with a ceramic static electricity chuck, a non-ceramic static electricity chuck, a bipolar static electricity chuck, a mono-Poral static electricity chuck, a mechanical chuck, a vacuum chuck, and the chuck of what kind of format containing an equivalent thing. Generally, it can be used also for the clamping equipment of whether this invention is designed so that a wafer may be held on the front face of a base, and the becoming format. The static electricity chuck is an example of such clamping equipment.

[0011]

According to this invention, the layer of an electrical conducting material 15 is prepared in the surroundings of the periphery part on the front face 14 of support. A conductive layer 15 is formed by the chemical vacuum deposition or the physical vapor depositions of an electrical conducting material, such as titanium, on a support front face. An ingredient has the thickness of about one to 9 micrometer, and as shown in drawing 1 , in order to connect with community or a grounded circuit 16, it deposits it on the support front face 14. In the gestalt of suitable operation, equipment 10 includes the signal measuring circuit generally indicated to be three piezo-electric sensors 18, 19, and 20 formed so that it might extend in the upper part from the chuck support front face 14 by the number 22.

[0012]

In drawing 2 , a piezoelectric device contains the top layer 25 of titanium (Ti) and the bottom layer 24, and the interlayer 26 of diacid-ized zinc (ZnO_2) so that the typical piezo-electric sensor 18 may be shown. The layer of the titanium which constitutes the piezo-electric sensor 18, and diacid-ized zinc is deposited on the support front face 14 of the static electricity chuck 12 by the physical vapor deposition, and has the cumulative thickness of about 13 to 70 micrometer. Deposition is performed through the similar plate placed on the mask or the support front face. In the United States patent application serial number 08/No. 736,887 of application, it argues about the instantiation-mask and the deposition technique on October 25, 1996 transferred in common. Although this application shows titanium as a suitable ingredient about a mask, other ingredients, such as a ceramic (alumimium nitride), are shown. A ceramic is a suitable ingredient to use it in order to manufacture the piezo-electric sensor of this invention. For example, the bottom layer 24 deposits on about one to 9 micrometer thickness first. Next, an interlayer

26 deposits to about 11 to 50 micrometer thickness on the bottom layer 24. Finally, the top layer 25 deposits to about one to 9 micrometer thickness on an interlayer 26. Although titanium is shown as a suitable ingredient of a top and the bottom layers 24 and 25, respectively, the ordinarily available ingredient which can accumulate on the support front face 14 easily, can paste up, and is compatible by the use in an ultra-high-vacuum (UHV) environment is suitable. As such an ingredient, it is not restrictive and can choose from the group who consists of copper, titanium nitride, a tantalum, and a tungsten. Diacid-ized zinc is classified as an interlayer's 26 suitable ingredient as that in which ****** has a piezo-electric property, and the ordinarily available ingredient which has the capacity to generate a current according to the piezo-electric effect or its equivalent effectiveness is also suitable.

[0013]

In drawing 2 , the bottom titanium layer 24 has connected the inside of the electrostatic chuck 12 to the prolonged suitable conductor 28 so that the typical piezo-electric sensor 18 may be shown. Similarly, as shown in drawing 1 , the electrostatic sensors 19 and 20 are connected to the conductor 28 shown in drawing 2 , and the conductors 29 and 30 prolonged in the inside of the static electricity chuck 12 in the same mode, respectively. An example of the approach for manufacturing conductive trace and interface connection in a ceramic chuck is shown in the United States patent application serial numbers 08/834,702 of application ("conductive penetration and its manufacture approach" of a ceramic body) on April 1, 1997 transferred in common.

[0014]

In some cases, the cumulative thickness of a sensor must be considered carefully. The substrate 14 will not fully be held on the chuck 12, if the cumulative thickness of a sensor decreases the static electricity chucking force substantially. Existence of such a condition uses the gestalt of another operation of this invention as shown in drawing 3 . The static electricity chuck 30 which has two or more hollows 32 is formed all over a support front face at a detail (one typical hollow 32 is illustrated for the conciseness of drawing 2 and drawing 5 , and consistency). The piezo-electric sensors 18, 19, and 20 are incorporated into the hollow 32 in the support front face 14, and all the viewpoints (for example, the bottom, middle, a top, and a conductive layer) of other sensor structures of them are still the same as that of it of the gestalt of the 1st operation. A hollow 32 is located in the range of the depth of about one to 100 micrometer depending on the cumulative thickness of a sensor. A hollow 32 can be formed in this contractor of the static electricity chuck manufacture with any means known. Corpuscle blasting, etching, or a similar approach is included rather than is restrictive. Preferably, a hollow is the depth in which about 5 - 6 or more micrometers of sensors do not project on the support front face 14 of a chuck 30. For example, in the sensor which has the cumulative thickness (a bottom layer with a thickness of about 3 micrometers, an interlayer with a thickness of about 4 micrometers, and a top layer with a thickness of about 3 micrometers are included) of about 10m, the depth of a hollow is about 5 micrometers, therefore about 5 micrometers of sensors project the support front-face 14 top. Thus, a sensor is one-like as a support front face, there is and it carries out the distance protrusion of the contact surface between a wafer and a chuck. Thus, it is not made to decrease, when holding a wafer, so that the part or distance of a sensor prolonged in the contact surface top is compressed, and the substrate 42 is still supported on the support front face 14 and the force of chucking cannot be

permitted as a sensor is enough to generate a required piezo-electric signal (for it to explain to a detail henceforth).

[0015]

The signal measuring circuit 22 of the gestalt of suitable operation of drawing 1 includes three suitable peak detectors 31, 32, and 33 of the type known by this contractor, in order to detect the peak of the piezoelectricity graphically shown according to the piezoelectricity peak P in drawing 1 , or a piezo-electric current. The piezo-electric sensors 18, 19, and 20 are connected to the peak detectors 31, 32, and 33 by conductors 28, 29, and 30, respectively so that I may be further understood from drawing 1 . It connects with a common circuit or touch-down 16 again, and the peak detectors 31, 32, and 33 cross them, and are connected to each piezo-electric sensor 18, 19, and 20. The output of the peak detectors 31, 32, and 33 is connected to the suitable comparator circuit 40 by conductors 35, 36, and 37, respectively. A comparator circuit 40 is the type known by this contractor, receives an input signal and generates various output signals according to the internal-circuitry configuration of a comparator circuit.

[0016]

In the time of being shown in drawing 2 , being placed on the piezo-electric sensor 18 by which semi-conductor wafers, such as the typical semi-conductor wafer 42, are typically shown in the piezo-electric sensors 18, 19, and 20 and drawing 2 which are shown in drawing 1 , and being engaged In case a suitable electrical potential difference is impressed to the electrodes 46, 47, and 48 embedded in the static electricity chuck 12, depending on the ingredient with which a chuck is manufactured, the semi-conductor wafer 42 can be drawn near to the static electricity chuck according to above-mentioned Johnson-Leh Beck or the coulomb effectiveness. When the semi-conductor wafer 42 can draw near to the static electricity chuck 12, the semi-conductor wafer 42 engages with the piezo-electric sensor 18, for example, the typical piezo-electric sensor shown in drawing 2 , is pressed, and generates the charge of antipole nature on a top, the bottom titanium layer 23, and 24. These antipole nature charges generate the spike of the piezo-electric electrical and electric equipment, and this starts quickly, when the sensor 18 is compressed between the wafer 42 and the support front face 14. The electrical and electric equipment will collapse to zero quickly, if chucking actuation will be completed and a piezo-electric sensor will not be compressed further. When at least one piezo-electric sensor is compressed, a piezo-electric sensor generates the electrical and electric equipment detected by one peak detector in piezo-electricity. Answering the electrical and electric equipment, a peak detector supplies an output signal to a comparator 40. A comparator 40 receives the output signal from one of a peak detector, and since the comparator output signal shown by the arrow head 42 which shows existence of a semi-conductor wafer on a chuck 12 is generated, it has the suitable internal circuitry of the known type to this contractor.

[0017]

When answered and compressed into chucking actuation of the semi-conductor wafer which all three piezo-electric sensors 18, 19, and 20 mentioned above, all three piezo-electric sensors generate the electrical and electric equipment detected by all three peak detectors 31, 32, and 33 in piezo-electricity. All three peak detectors give an output signal to a comparator 40. A comparator includes the suitable electrical circuit known by this contractor in order to supply the output signal shown by the arrow head 43 which shows

that it is located at the core by receiving the output signal from all three peak detectors, and a semi-conductor wafer existing on the chuck support front face 14.
[0018]
Furthermore, a peak detector is a circuit of the type which generates an output signal and which is known by this contractor, when the electrical and electric equipment equal to a threshold or predetermined level as shown in the alphabetic character T of drawing 1 is detected. Predetermined or threshold level T is beforehand defined as level which is generated at the time of the strength of sufficient chucking force to maintain a wafer on a chuck in the case of processing of a subsequent semi-conductor wafer. Therefore, when all three piezo-electric sensors are fully compressed by maintenance actuation of the above-mentioned semi-conductor wafer, all three sensors generate the electrical and electric equipment equal to predetermined or threshold level T at least, and all three peak detectors 31, 32, and 33 generate an output signal in a comparator 40. Since the comparator output signal shown by the arrow head 44 is generated, an output signal is received by this contractor by the suitable internal circuitry of the type known. This comparator output signal shows that the chucking force of sufficient amount for a semi-conductor wafer is applied by the static electricity chuck, in order to enable processing of the further semi-conductor wafer. Furthermore, as for a related peak detector, a signal is not given to a comparator 40 when fully not being pressed, although at least one piezo-electric sensor generates the electrical and electric equipment equal to predetermined level or threshold T at least. consequently, chucking force sufficient [a comparator internal circuitry / for processing of a subsequent semi-conductor wafer] -- strength -- the signal shown by the arrow head 45 which shows things is generated. The output signal from a comparator may be a signal transmitted to the central-process unit which controls voice, a visual signal, or the whole semi-conductor wafer processing system. Therefore, in case a comparator 40 generates an output signal 45, such a central-process unit stops semi-conductor wafer processing, and does not manufacture an integrated circuit with the possibility of a defect, or slides a wafer according to the weak chucking force, and removes it from a chuck.
[0019]
The equipment 10 of this invention is realizable in order to detect only existence of the semi-conductor wafer on a chuck 12. With the gestalt of such operation, the comparator 40 of drawing 1 is equipped with the internal circuitry known by this contractor in order [all] to crawl again and to receive the output signal from a gap or one peak detectors 31, 32, and 33, and in case a signal is generated by any one of such the peak detectors, a comparator generates the output signal shown by the arrow head 42 which shows that a semi-conductor wafer exists on a semi-conductor chuck. Therefore, since the strength which carries out chucking of the wafer to a chuck in order to detect whether there is any wafer at the core of a chuck in order to detect existence of the semi-conductor wafer on a chuck is detected, the equipment and the approach of this invention can be enforced for what kind of combination of detection of the above-mentioned semi-conductor wafer.
[0020]
Generally reference of drawing 4 and drawing 5 shows the semi-conductor wafer detection equipment of the gestalt of another alternative-operation of this invention by number 10A. The static electricity chuck 12 which was shown in drawing 1 and drawing 2 , and was mentioned above is shown in drawing 4 and drawing 5 . the wafer of the type

which is generally mentioned above in the support front face 14 of a chuck 12, and is indicated by U.S. Pat. No. 5,656,093 -- alienation -- the mask is prepared. Generally a wafer support mask is shown by the number 100, and contains the pad or the supporter material 112 prolonged in two or more upper parts for estranging a semi-conductor wafer from the support front face 14 of the static electricity chuck 12 in the case of the semi-conductor wafer of chucking and after that, and maintaining, and being engaged.

[0021]

In the gestalt of this alternative-operation of this invention, the piezo-electric sensors 18A, 19A, and 20A are formed instead of at least one pad or the supporter material 112. And in the gestalt of suitable operation, it is prepared instead of a pad or the supporter material 112A, 112B, and 112C. With the gestalt of suitable operation, a pad or the supporter material 112A, 112B, and 112C is mutually estranged at equal intervals around the periphery part of the chuck support front face 14, and the predetermined thing of supporter material (112A, 112B, and 112C) is transposed to Sensors 18A, 19A, and 20A, respectively. If drawing 5 is referred to, he can understand this well. This drawing is drawing typical piezo-electric sensor 18A as ****** from the titanium bottom and the top layers 24 and 25, and the interlayer 26 of diacid-ized zinc. Except for permuting by at least one supporter material 112A, 112B, and 112C, Sensors 18A, 19A, and 20A are constituted similarly to what was shown and explained to drawing 2 and drawing 3 , and have the same function. However, since the supporter material 112 also exists on the support front face 14, to enlarge cumulative thickness of a sensor slightly rather than the thickness of the supporter material 112 is desired. Especially the supporter material 112 usually consists of incompressible ingredients, such as titanium. For this reason, a sensor must be thicker than supporter material, in order to give the compression distance (d) which can generate a piezo-electric signal. Preferably, this distance is about two to 5 micrometer (an artificer checks). When the ingredient of supporter material is a compressive ingredient, thickness of supporter material and a sensor is made almost equally.

[0022]

Drawing 6 shows the gestalt of another operation. Here, a sensor is arranged on one or more supporter material (only typical sensor 18A allotted on supporter material 112A typical for conciseness is shown). Again, the sensor is the same as that of having described above, and it has in a detail bottom 24A of titanium and the top 25 A horizon which allotted middle class 26A of diacid-ized zinc in between. The layer which constitutes piezo-electric sensor 18A is deposited by the physical vapor deposition on a pad or the supporter material 112A and 112B, and 112C. A top and the bottom layers 24A and 25A have the thickness of about one to 9 micrometer, respectively, interlayer 26A has the thickness of about 11 to 50 micrometer, and the cumulative thickness of a sensor is about 13 to 70 micrometer. From drawing 6 , outside layer 25A of titanium is deposited so that contact engagement may be electrically carried out with layer 15A of the conductor ingredient prepared in the surroundings of the periphery part of the static electricity chuck support front face 14. Layer 15A of a conductor ingredient is prepared in the same mode as the layer 15 of the conductor ingredient shown and mentioned above by drawing 1 and drawing 2 . inside layer 24A of the titanium of piezo-electric sensor 18A of drawing 6 -- a conductor -- it connects with the same signal measuring circuit 22 as the signal measuring circuit 22 which was shown to drawing 1 by 28A and mentioned

above. Similarly, the piezo-electric sensors 19A and 20A generally shown in drawing 4 are connected to the signal measuring circuit 22 by Conductors 29A and 30A.
[0023]
the piezo-electric sensors 18A, 19A, and 20A -- a semi-conductor wafer -- alienation -- if the point established on the pad of a mask 100 or the supporter material 112A and 112B, and 112C is removed, semi-conductor wafer detection equipment 10A operates in the same mode as the semi-conductor wafer detection equipment 10 mentioned above. In a detail, equipment operates so that existence of the semi-conductor wafer on a chuck 12 is detected, it may detect whether there is any semi-conductor wafer at the core of a chuck 12, and the strength which carries out chucking of the semi-conductor wafer to a chuck may be detected and one combination of these wafer detection may be performed. Such detection by semi-conductor wafer detection equipment 10A is offered in the combination of the same detection as having been mentioned above about semi-conductor wafer detection equipment 10.
[0024]
As mentioned above, although the gestalt of various operations of this invention was shown and explained to the detail, this contractor can consider the gestalt of operation of this invention by which many others were transformed easily.
[Brief Description of the Drawings]
[Drawing 1] The rough top view showing the piezo-electric sensor and signal generating circuit relevant to a semi-conductor wafer chuck.
[Drawing 2] The rough fragmentary sectional view seen in the direction of an arrow head along with two to 2 line of drawing 1 .
[Drawing 3] The rough fragmentary sectional view which cut along with two to 2 line of drawing 1 about the gestalt of another operation of this invention, and was seen in the direction of an arrow head.
[Drawing 4] a wafer -- alienation -- the top view of the static electricity chuck which has the support front face in which the mask was prepared.
[Drawing 5] The rough fragmentary sectional view seen in the direction of an arrow head along with five to 5 line of drawing 4 .
[Drawing 6] The rough fragmentary sectional view which cut along with five to 5 line of drawing 4 about the gestalt of another operation of this invention, and was seen in the direction of an arrow head.

CLAIMS

[Claim(s)]
[Claim 1] In the equipment for detecting existence of the semi-conductor wafer on a semi-conductor wafer chuck including a support front face at least The piezo-electric sensor by which the part projected outside from the support front face, and was carried on said chuck at least, When it connects with said piezo-electric sensor and a semi-conductor wafer is supported by the support front face of said chuck, Signal measuring circuit which receives the electrical and electric equipment which a semi-conductor wafer engages with a support front face and said piezo-electric sensor between this wafer, and compresses, and said piezo-electric sensor generates in piezo-electricity Equipment which it had.
[Claim 2] Equipment according to claim 1 which said piezo-electric sensors are two or more piezo-electric sensors, and has the comparator circuit connected to at least one peak detector where said signal measuring circuit crosses said piezo-electric sensor, and is connected, and said peak detector.
[Claim 3] Equipment according to claim 1 which is for detecting the strength to which said equipment holds a semi-conductor wafer by the semi-conductor wafer chuck further, and is what said signal measuring circuit detects the amount of said electrical and electric equipment, and generates the signal with which said signal measuring circuit shows the strength [the semi-conductor wafer of said chuck] of maintenance when said electrical and electric equipment is equal to a predetermined amount at least.
[Claim 4] Said signal measuring circuit includes [said piezo-electric sensor] at least one peak detector and comparator circuit including at least one piezo-electric sensor. Said peak detector crosses said piezo-electric sensor, and connect, and it connects with said comparator circuit. Equipment according to claim 3 which generates the signal with which said peak detector gives a signal to said comparator circuit for said electrical and electric equipment when a receipt and said electrical and electric equipment are equal to a predetermined amount at least, and it shows the strength of maintenance of said comparator circuit of the semi-conductor wafer of said chuck.
[Claim 5] Said equipment is further for detecting whether a semi-conductor wafer is located at the core on the front face of support. Said support front face contains two or more piezo-electric sensors by which said piezo-electric sensor has been arranged at equal intervals around a periphery part including a periphery part. Equipment according to claim 1 with which said signal measuring circuit generates the 2nd signal which shows that the 1st signal which shows that all of said piezo-electric sensors generate the electrical and electric equipment, and there is a semi-conductor wafer at the core of a chuck is generated, and all of said piezo-electric sensors do not generate the electrical and electric equipment, but there is no semi-conductor wafer in the core of a chuck.
[Claim 6] For each of said peak detector, said signal measuring circuit is equipment according to claim 5 with which one of said the piezo-electric sensors is crossed, and it connects including two or more peak detectors equal to the number of said piezo-electric sensors, and the comparator circuit connected to said peak detector.
[Claim 7] For a semi-conductor wafer chuck, said equipment is equipment according to claim 6 with which the strength holding a semi-conductor wafer is detected, a signal is given to said signal measuring circuit when equal to an amount predetermined [at least] in the electrical and electric equipment which each of said peak detector circuit receives, and said comparator circuit generates the signal with which the strength [the semi-

conductor wafer of a chuck] of maintenance is shown further.
[Claim 8] Equipment according to claim 2 with which the wafer support mask containing two or more pads prolonged outward from a support front face is prepared in the support front face of a semi-conductor wafer chuck, and said at least one piezo-electric sensor is permuted by at least one pad.
[Claim 9] the wafer containing two or more pads prolonged outward from a support front face on the support front face of a semi-conductor wafer chuck -- alienation -- the equipment according to claim 5 with which a mask is prepared, the predetermined thing of the pads is arranged at equal intervals around the periphery part on the front face of support, and said two or more piezo-electric sensors are permuted by the predetermined thing of a pad.
[Claim 10] Equipment containing the double layer component for which it generates the electrical and electric equipment of the piezo-electric effect when said piezo-electric sensor is pressed to a chuck according to claim 1.
[Claim 11] Equipment according to claim 10 with which said one titanium layer is being fixed to the support front face for said double layer component including at least two titanium layers and the middle diacid-ized zinc layer of said titanium layer.
[Claim 12] In the equipment for detecting the strength of the maintenance to the semi-conductor of a semi-conductor wafer The piezo-electric sensor carried in the chuck so that the part might project outside at least from support front face, when a semi-conductor wafer is held at a chuck even as sufficient strength to maintain the semi-conductor wafer held by the chuck on the occasion of subsequent semi-conductor wafer processing including the signal measuring circuit connected to said piezo-electric sensor Said equipment which generates the signal with which said piezo-electric sensor generates the piezoelectric electrical and electric equipment of a predetermined amount, and said signal measuring circuit shows the strength of maintenance of reception and said signal measuring circuit of the semi-conductor wafer to a chuck.
[Claim 13] Equipment according to claim 12 with which said piezo-electric sensor includes the comparator circuit where the signal measuring circuit was connected to at least one peak detector and this peak detector including two titanium layers and the layer of the diacid-ized zinc arranged between titanium layers.
[Claim 14] In a thing including the support front face where it is equipment for determining whether the semi-conductor wafer is located at the core of a semi-conductor wafer chuck, and said chuck has a periphery part Two or more piezo-electric sensors which were carried in chuck, and have been arranged at equal intervals around the periphery part on the front face of support, When it has the signal measuring circuit connected to said two or more piezo-electric sensors, a semi-conductor wafer is placed on a chuck and it is held at a chuck, The piezo-electric sensor of a semi-conductor wafer and two or more of said piezo-electric sensors which exist in the middle of a chuck generates the electrical and electric equipment which is compressed and is received by said signal measuring circuit in piezo-electricity. When said signal measuring circuit receives the electrical and electric equipment from all the piezo-electric sensors in said two or more piezo-electric sensors, The 1st signal which shows that there is a semi-conductor wafer at the core of a chuck is generated. And said equipment which generates the 2nd signal which shows that there is no semi-conductor wafer in the core of a chuck when said signal measuring circuit detects that the electrical and electric equipment is generated by

no piezo-electric sensors in said two or more piezo-electric sensors.
[Claim 15] Said peak detector is equipment according to claim 14 which crosses said piezo-electric sensor and is connected including two or more peak detectors where said signal measuring circuit is equal to the number of said two or more piezo-electric sensors and the comparator circuit connected to this peak detector including the diacid-ized zinc layer of said piezo-electric sensor which exists in the middle of a titanium layer and a titanium layer, respectively, respectively.
[Claim 16] In the approach of determining whether a semi-conductor wafer exists on a semi-conductor wafer chuck At least one piezo-electric sensor is made to intervene between a semi-conductor wafer and a chuck, a semi-conductor wafer is held by the chuck, and a piezo-electric sensor generates the electrical and electric equipment according to the piezo-electric effect. Said electrical and electric equipment is detected and the signal which shows that a semi-conductor wafer exists on a chuck is generated. Approach containing things.
[Claim 17] In that in which it is the approach of detecting existence of the semi-conductor wafer on the support front face of a semi-conductor wafer chuck at least, and a chuck includes a support front face A piezo-electric sensor is carried in a chuck so that the part may be prolonged outside from a support front face at least. Hold semi-conductor wafer by the chuck, and a semi-conductor wafer engages with a chuck and said piezo-electric sensor between semi-conductor wafers, and presses. A piezo-electric sensor generates the electrical and electric equipment according to the piezo-electric effect. Said electrical and electric equipment is detected and the signal which shows existence of the semi-conductor wafer on a chuck at least from there is generated. Approach containing each step.
[Claim 18] In the approach of detecting whether a semi-conductor wafer being located at the core on a semi-conductor wafer chuck including a support front face Two or more piezo-electric sensors of each other are estranged at equal intervals around the periphery part on the front face of support. And it carries in a chuck so that some piezo-electric sensors [at least] may be prolonged outside from a support front face. Place semi-conductor wafer on a piezo-electric sensor, and a semi-conductor wafer is held by the chuck. A semi-conductor wafer presses the piezo-electric sensor between a chuck and a semi-conductor wafer. And the piezo-electric sensor between a semi-conductor wafer and a chuck generates the electrical and electric equipment according to the piezo-electric effect. Detect said electrical and electric equipment and it is determined how [in which said electrical and electric equipment is generated by all the piezo-electric sensors in said two or more piezo-electric sensors] it is. The 1st signal which shows that there is a semi-conductor wafer at the core of a chuck when it determines that said electrical and electric equipment is generated by all the piezo-electric sensors in said two or more piezo-electric sensors is generated. The 2nd signal is generated when it determines that said electrical and electric equipment is generated by no piezo-electric sensors in said two or more piezo-electric sensors. Approach containing each step.
[Claim 19] In the approach of detecting the strength to which a semi-conductor wafer chuck including a support front face holds a semi-conductor wafer At least one piezo-electric sensor is carried in a chuck so that some piezo-electric sensors [at least] may be prolonged outside from a support front face. Hold semi-conductor wafer by the chuck, and a semi-conductor wafer presses a piezo-electric sensor. And a piezo-electric sensor

generates the electrical and electric equipment according to the piezo-electric effect. It detects whether said electrical and electric equipment reached predetermined level, and when said electrical and electric equipment reaches predetermined level at least, the signal which shows the strength of the maintenance to the chuck of a semi-conductor wafer is generated. Approach containing each step.

[Claim 20] In the approach of detecting the strength to which a semi-conductor wafer chuck holds a semi-conductor wafer When a semi-conductor wafer is held even as sufficient strength to maintain a semi-conductor wafer by the chuck in the case of processing of the semi-conductor wafer of after that, determine the amount of the electrical and electric equipment generated by the piezo-electric sensor pressed by intervening between a semi-conductor wafer and a chuck, and an electric threshold level is set up. Make a piezo-electric sensor intervene between semi-conductor wafer chuck and a semi-conductor wafer, and a semi-conductor wafer is held by the chuck. A piezo-electric sensor is pressed and the electrical and electric equipment of operation is generated. Detect the generated electrical and electric equipment of operation, and if it determines and becomes so, whether the generated electrical and electric equipment of operation is equal to an electric threshold level at least The signal which shows that the semi-conductor wafer is held at the chuck even as sufficient strength to maintain a semi-conductor wafer by the chuck in the case of processing of a subsequent semi-conductor wafer is generated. Approach containing each step.

[Claim 21] Support front face Composite construction on the support front face which extended outside from the support front face It is the supporting structure which has the compression description which generates the signal which shows compression of itself when it contains and said composite construction is compressed, and shows that the body which should be held on itself is received, and which can be read.

[Claim 22] One equipment [a sensor] according to claim 1 as a support front face.

[Translation done.]